DRAFT MEMORANDUM

To:	**Robert Law**
From:	**Han Winterwerp, Rooni Mathew, Rafael Cañizares**
Date:	**September 28, 2012**
Subject:	**Comments on Draft QAPP for Sediment Erosion Rate Measurements in the Newark Bay Study Area**
Project:	**Lower Passaic River/Newark Bay (LPR/NB) Modeling Program**
CC:	

A sampling program is being developed to collect and test Sedflume samples in Newark Bay to support the development of a Newark Bay sediment transport model as part of the LPR/NB Model being completed by the Cooperating Parties Group. The goal of Newark Bay sediment transport modeling is threefold:

- Contribute to the general system understanding of Newark Bay
- Establish stability of legacy sediments and their fate when mobilized
- Establish exchange between Newark Bay and Lower Passaic River

Newark Bay is well off-equilibrium from a morphological point of view, owing to ongoing deepening and maintenance dredging. It is likely that the deepened channels within the Bay fill up with sediment from:

- the Kills – in particular Arthur Kill is a well-known source of fine sediments
- the Lower Passaic River and Hackensack Rivers at large river flows
- natural redistribution within the Bay – in particular a net (fine) sediment transport from the shallows into the deeper channels is expected
- dredging and dumping to maintain the fairways

Within Newark Bay, a net transport of fines in northern direction has been found, driven by estuarine circulation and tidal asymmetry. Part of this sediment will enter the Lower PassaicRiver and probably the Hackensack as well, when these rivers are off equilibrium after a flood. It is not to be expected that those parts of the Bay that are off equilibrium will be subject to erosion, e.g. the deeper navigational channels.

Hence, we can identify the following three processes that should be represented by the model:

1. Erosion of shallow areas by hydrodynamic forcing (tide and waves), and possibly by shipping
2. Dispersion and fate of the eroded sediments

3. Transport and fate of fine sediments entering the Bay from the Kill's and the rivers, and transport towards the Lower Passaic River and Newark Bay

The last process can be referred to as the "conveyer belt" function of the Bay. Fine sediments will move in discrete steps, i.e. sit on the bed around slack water, and are picked up during accelerating tide, moving to and from, but trend in a northern direction over longer time scales. During slack water, these sediments form soft layers of mud on the bed. The effects of dredging (and dumping) should be accounted for, but are to be prescribed to the model.

The proposed Sedflume program can help to identify some of the important processes, in particular establish erosion rates from the shallow areas. If the distribution of legacy sediments is included in the selection of sampling locations, the Sedflume program can contribute to:

- Assessment of erosion rates of shallow areas
- Assessment of stability of legacy sediments

The Bay's "conveyer belt" function can best be analyzed and the model can best be calibrated using maintenance dredging volumes – such data provide information on an aggregated and integrated way on the transport and fate of fine sediments in the Bay in general, and through the channels in particular. This information may be supplemented with Sedflume experiments. Given the expectation that amounts and properties on the channel bed will be highly variable owing to their supply phases within the tide, navigation and dredging, it is proposed to work with consolidated sediments samples, i.e. obtained by consolidation "cores" of remolded slurries taken from the Bay.

Given the importance of the exchange of fine sediments between the LPR and NB, a number of Sedflume cores are to be taken close to the LPR mouth, to be detailed on the basis of the results of numerical modeling exercises carried out. Other locations are determined from two criteria:

- distribution of legacy sediments, and
- even distribution throughout the Bay for coverage.

Figures 1, 2, and 3 presents a proposal for the distribution of the Sedflume cores relative to the surficial sediment texture, wind-wave shear stresses, surficial concentrations of 2,3,7,8 TCDD and mercury.

Finally, we suggest bringing a small Van Veen grab, and taking a quick bed sample for visual inspection of the sediment composition in the field. If too sandy, ignore that site, and sample in the near vicinity until suitably muddy sediment is obtained.

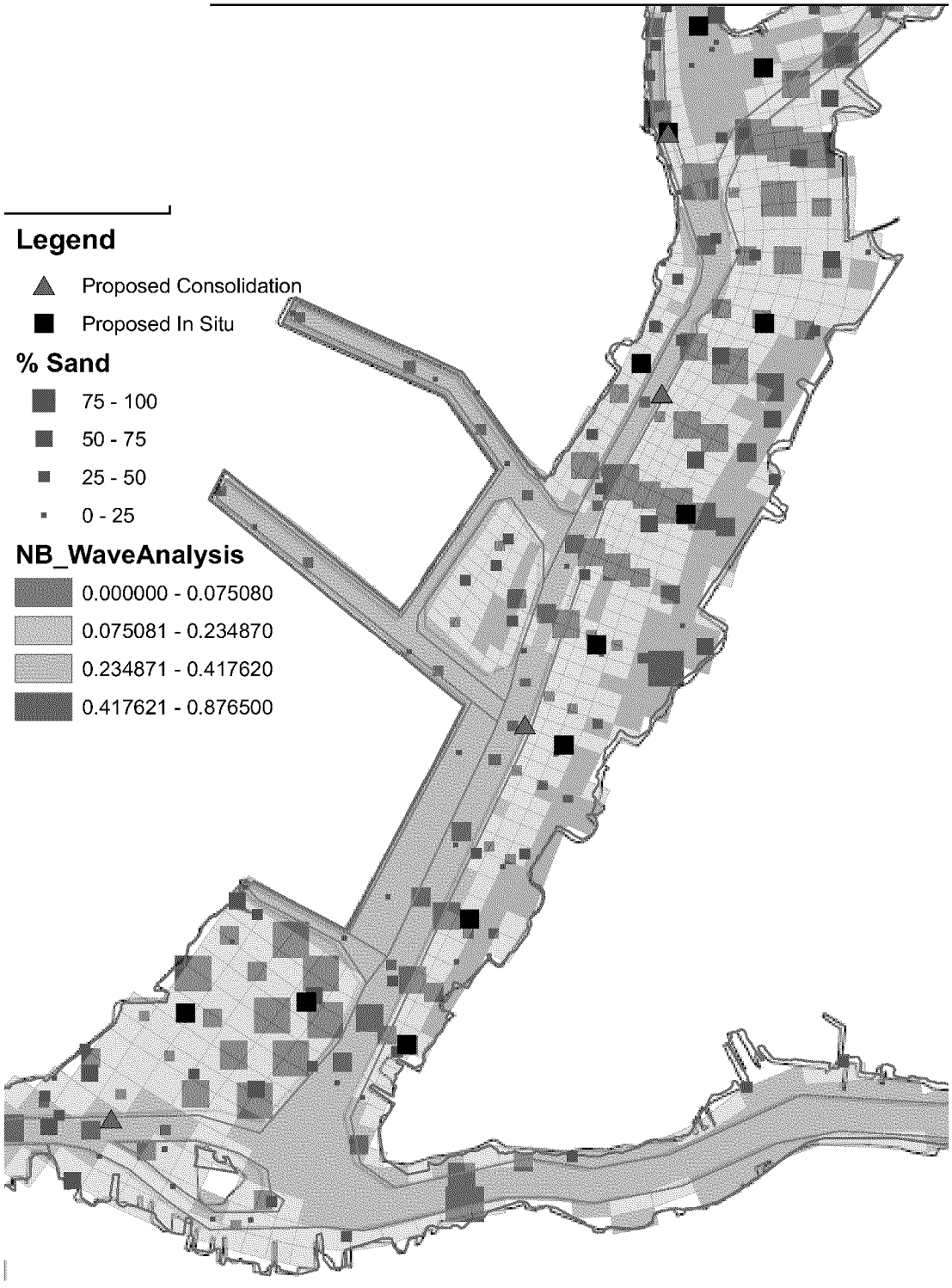

Figure 1. Locations of consolidation and in situ sampling stations relative to sediment texture and wind-wave shear stresses

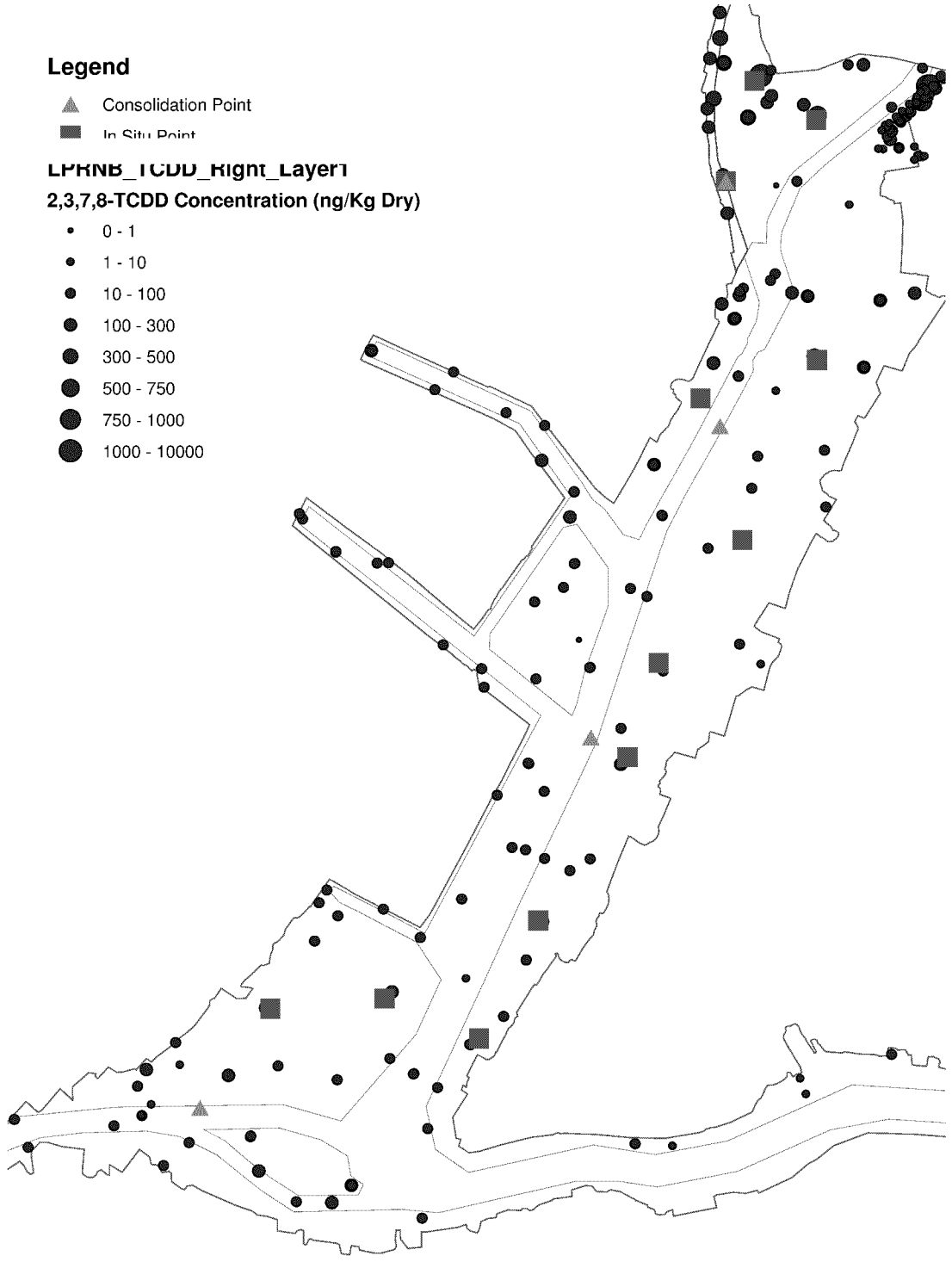

Figure 2. Locations of consolidation and in situ sampling stations relative to surficial sediment 2,3,7,8 TCDD data

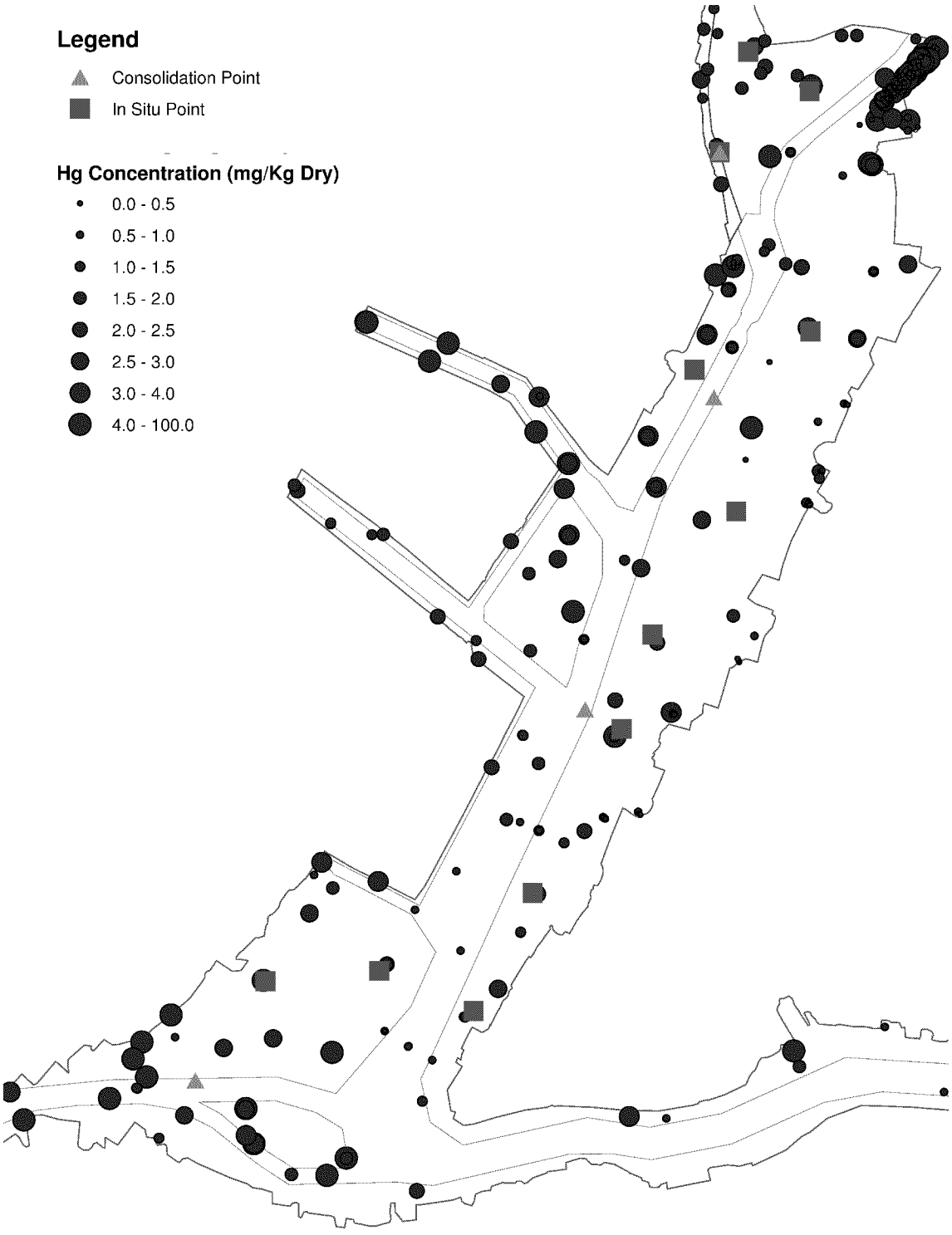

Figure 3. Locations of consolidation and in situ sampling stations relative to surficial sediment mercury data